IF WE BUILD IT, WILL THEY COME?

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PURPOSE

This project describes the Washington State Department of Transportation's (WSDOT) methodology to identify the potential number of pedestrian trips within a suburban roadway corridor. The department, which operates through regional offices, owns and maintains over 7,000 miles of roadways. The transportation system needs are identified at the regional level. They identify which roadway projects to build and improve based on traffic modeling projections. Projects are then ranked and prioritize based on benefit cost analysis. However, no similar "tool" exists to evaluate the need for sidewalks. The intent of this project was to give WSDOT regional planners a tool to determine which corridors have the highest pedestrian levels.

BACKGROUND

Initially, WSDOT used the Federal Highway Administration's 1970's pedestrian trip generation[1] rates at a test site to check their appropriateness for a suburban location. The test site was a two mile stretch along SR 510 south of I-5 in Lacey (Marvin Road). The trip generation tables did not work at this site. Rates applied to retail establishments indicated higher *pedestrian trips* than the total business transactions some businesses had per day. Instead, the department developed another methodology by aggregating household population data and multiplying it by national transportation trip survey percentages to determine potential walking trips.

The pilot site chosen for this test is characterized by strip commercial/ retail development and fringe urban sprawl on a state route. The one mile length includes low density residential development, two schools plus a community college branch campus, numerous fast food restaurants, mini-marts, gas stations, a 148,000 square foot mixed use retail mall, several smaller mixed use buildings, numerous drive thru banks, four lane roadways with left turn channels and a major intersection. See Figure 1.

This tool will answer the following questions for regional transportation planning engineers:

1. Why provide a pedestrian system?
2. Who walks?
3. What information is needed to measure pedestrian trip potential?
4. How is the data used?

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[1] *A Pedestrian Planning Procedures Manual*, Report No. FHWA-DA-79-4, 1978.

SR 510 Landuse

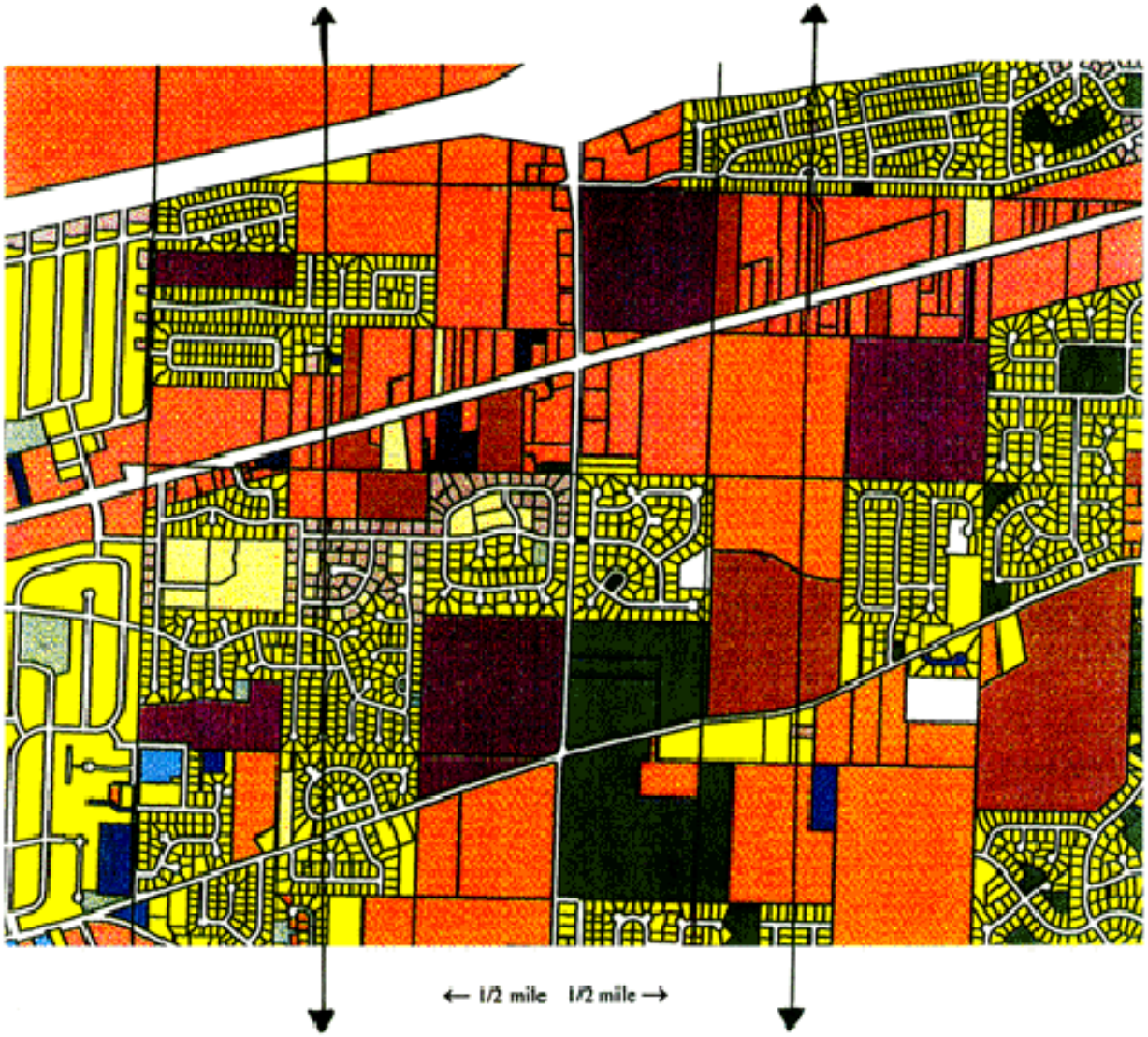

Figure 1

Text
Roads
S14181w
S13181w
S12181w
S11181w
Lacuse
2 to 4 Residential Units
Church
Commercial
GOVERNMENT AND INSTITUTIONAL S
Government & Institutional Ser
Government and Institutional S
Industrial
Institutional Lodging
Mobile Home Parks
Multi Family
Multi-Family Residential
Parks, Recreation & Green Belt
Parks, Recreation & Green Belts
Resource Production
Single Family Residential
Single Mobile Home
Transportation
Transportation/Utilities
Water

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Why Provide a Pedestrian System?

State transportation agencies (STAs) routes are often "Mainstreets" of communities or operate as major urban arterials. As such, in some areas there is significant pedestrian activity. The department recognizes these customers often cannot safely cross, or negotiate along these roadways. As the roads gets wider and vehicles travel faster people make less walking trips and are either forced to make short auto trips or jeopardize their safety with midblock crossings due to the great distance between intersections.

Designing the right system encourages people to make walking trips instead of short vehicle trips. Thirty nine percent of all trips under 1/2 mile are walking trips[2]. If pedestrians face a "hostile" walking environment, they will make a cold engine start and drive short personal or other trips. A well designed pedestrian system will reduce air pollution generated at the beginning and end of each auto trip[3]. By not allowing pedestrian access, short auto trips are created which generate short distance lane changes and other undesirable maneuvers.

Safety is also a key issue for pedestrian mobility. It is well documented that people's greatest reluctance to walk is their fear of traffic. Children struck by motor vehicles is the second leading killer of young children. A pedestrian struck at 40 miles per hour has a 85 percent chance of being killed, a pedestrian struck at 20 miles per hour has only a five 5 percent chance of being killed. Those most dependent on walking are also those most at risk of injury, children and the elderly. Over one-third of our population will be over 50 years old by the year 2010. A well designed pedestrian system will allow the elderly mobility without making vehicle trips.

Effective transit systems are also very dependent on a good pedestrian environment. If people cannot easily access the bus stops, they will choose an alternate mode of travel. And, unfortunately, often the transit stops are sited to accommodate driver's easy access in and out of traffic rather than safe and convenient access for the pedestrian.

When looking at trip data, it is important to understand that only one out of five trips is a work trip[4] - indicating that 4/5 of all trips are for non-work purposes such as children walking to school and errand trips to a mini-mart for milk. Social and recreational trips account for 1/4 of all trips and include trips to the neighborhood athletic fields for soccer or little league games and visits to friends. Nationwide over 7.2[5] percent of all trips were walking trips.

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[2] *Nationwide Personal Transportation Survey*/University of North Carolina Highway Safety Research Center.

[3] R. Roth, *Municipal Strategies to Increase Pedestrian Travel*, 1994.

[4] *1990 Nationwide Personal Transportation Survey* (NPTS).

[5] C. Zegeer, et.al, *The National Bicycling and Walking Study Final Report*, Publication No. FHWA-PD-94-023, Federal Highway Administration, 1994.

A corridor designed on the pedestrian scale enjoys an increase in shopping (people actually stop their cars to shop and browse) and sees the area become vibrant with human social. In addition, the planning agency becomes a good steward of public funds by investing in a multimodal system, reducing the need for short auto trips (thus reducing congestion), and increasing safety for the entire system.

Who Walks?

It is also important when looking at sites to determine what type of population lives in the corridor. Research indicates that single adults with children under 15 years old and two adults with children under 15 years old[6], the elderly, and children have a higher propensity to walk. Additionally, lower income households, the disabled, and people who live in multifamily housing make more trips as pedestrians and transit riders. Recreational users require good pedestrian systems. Most transit and school bus trips begin and end as a pedestrian trip, as do most trips.

As an example then, pedestrian facilities should be a primary factor in designing a viable transportation system if there is a high multifamily dwelling density, senior citizens' population, schools or the area is an active recreational area close to medium residential neighborhoods.

What information is needed to measure pedestrian trip potential?

Land use characteristics that would support a good pedestrian system are residential developments with at least four housing units per acre interspersed with multifamily dwellings and/or hotels located within one half mile of attractors that would draw personal business (shopping) or recreational trips. Less likely to attract pedestrian trips would be a large corporate business site[7].

There are several other topographical, climatic and social conditions which influence pedestrian trips that other research considers, including the *Nationwide Personal Transportation Survey Travel Mode Special Reports*. This simplified method only covers land use and travel mode split characteristics.

METHODOLOGY

The following steps list the process to quantify potential pedestrian trips.

1. Identify a 1/2 mile distance on both sides of the roadway corridor.
2. Contact regional MPOs or local planning offices for land use, TAZ, maps and transportation mode split information.
3. Identify housing density, types of housing and hotels in the corridor.

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[6] D. Niemeier and G. Scott Rutherford, *1990 NPTS Report Series Travel Mode Special Report, Non-Motorized Transportation*, 1994.

[7] Source #1 indicates there is an inverse relation between the number of pedestrian trips and the size of building, i.e. the larger the building the more self contained it becomes.

4. Identify types of retail (grocers/food establishments), recreational and social facilities, schools (including community colleges) and churches.
5. Contact transit provider for daily ridership within the corridor.
6. Contact the local school for number of enrolled children, how many are bussed and not bussed.
7. Identify park and ride lots, size and occupancy rate.
8. Match mode split with population density (housing and hotel).
9. Factor in school children trips, transit ridership, and park and ride pedestrian activity.
10. Consider secondary trips.

To analyze a corridor, measure out from the route 1/2 mile on each side. This represents the majority of walking trips. It is unrealistic to expect pedestrians to walk further than that distance from generators (housing, hotels) to attractors. Drive the route if possible.

The next key element is to make sure that there are housing and multifamily dwellings of at least four units per acre[8] within 1/2 mile of pedestrian attractors, such as mini-marts, fast food restaurants, transit stops, and schools. This information is readily available from Metropolitan Planning Organizations[9] or local city or county planning department's comprehensive plans. These plans usually provide excellent maps which identify housing developments, commercial areas and centers, schools and parks. See Figure 2.

Information obtained from Transportation Analysis Zones (TAZs) and U.S. Census block tracts are then applied to the 1/2 mile corridor. The TAZs contain information on the number of housing units and "other" housing units, number of persons per household unit, employment data (including types of retail and other data). They might not include hotels which are large pedestrian trips generators.

Again, a crucial factor is the proximity of the generators (housing and hotels) to the attractors (retail and other activity centers). Most pedestrian trips are less than 1/4 mile. Seventy-three percent of all pedestrian trips are under 1/2 mile[10]. The following table shows where people walk to:

	<1/2 Mile
To work	11.97%
Family/personal business	34.37%
School/Church	20.22%
Social/Recreation	32.46%
Other	0.97%
Total	99.02%

[8] Research indicates the more dense an urban area becomes the greater the number of pedestrian trips.

[9] Washington state also has Regional Transportation Planning Organizations (RTPOs).

[10] *1990 Nationwide Personal Transportation Survey* (NPTS).

Pedestrian Trip Variables

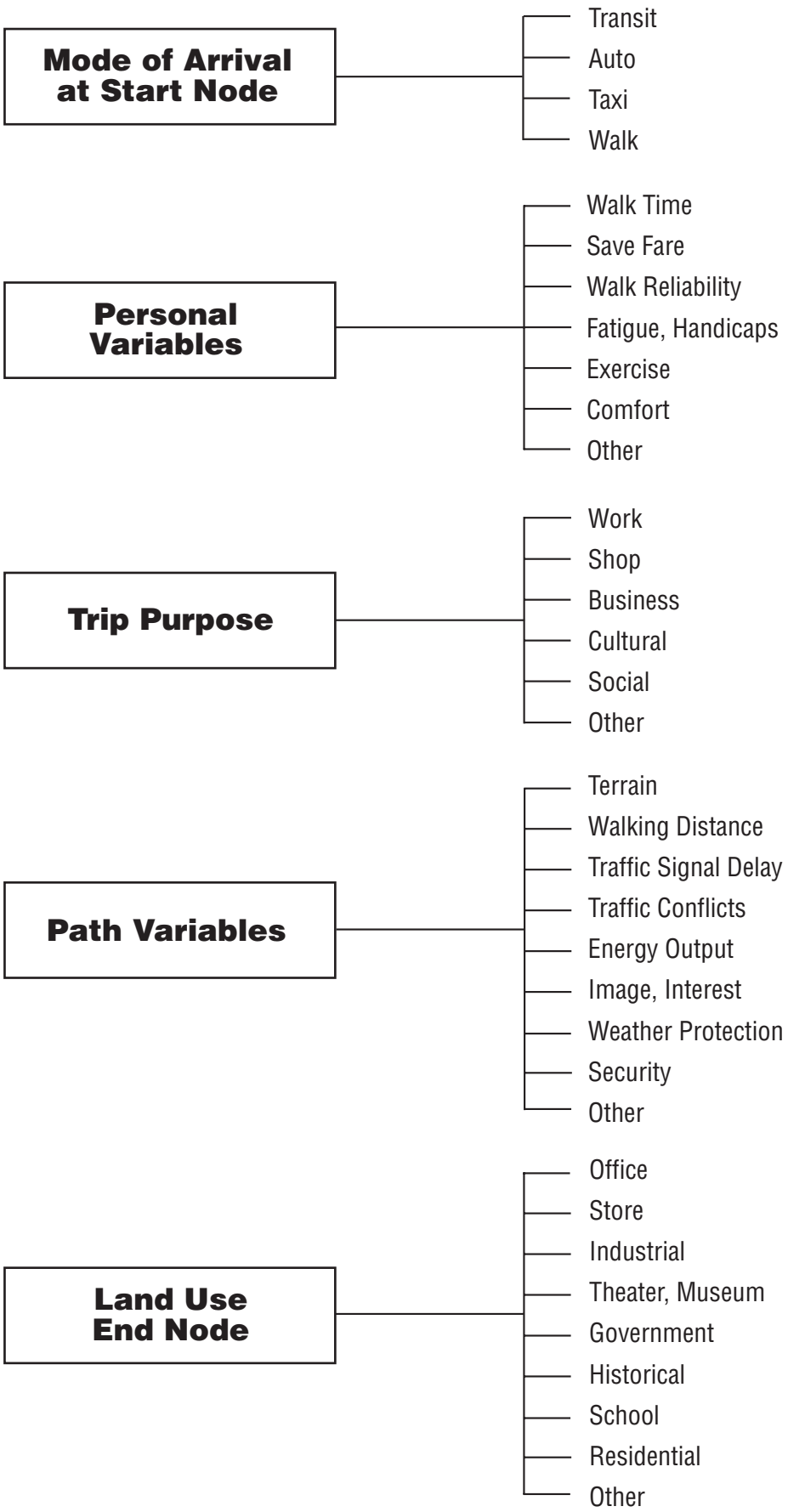

Figure 2

Source: Pedestrian Planning & Design, Elevator World, 1971, John Fruin

How is the data used?

At this site there are 1,290 single family dwelling units, with an average of 3.14 persons per unit and 939 "other" units (multifamily housing/mobile homes) with an average of 2.24 persons per unit[11]. This information was derived from the actual number of dwellings within the 1/2 corridor in each TAZ. The total population in the corridor using this data then is 3,530 people.

The next step then is to multiply the corridor's aggregate population either your regional trips per person or use the national trips per person (7.3) per day. Multiplying 3,530 by 7.3 gives a total trip number of 25,769. That number then is multiplied by the percentage of known trips under 1/2 mile, 13.56%[12]. This shows the total potential pedestrian trips if everyone walked for all trips less than 1/2 mile. To capture a more accurate number, take all trips under 1/2 mile and multiply it by the nationally known percent of all walking trips under 1/2 mile, 39.43%.

Population x Trips Per Person = Total Daily Corridor Generated Trips (TCGT)
TCGT x Total All Trips <1/2 Mile = Potential Pedestrian Trips (PPT)
PPT x % Known Walking Trips <1/2 Mile = Est. Primary Daily Pedestrian Trips

3,530 x 7.3% = 25,769 (total corridor daily generated trips)
25,769 x 13.56% = 3,494.27 (percent all trips less than 1/2 mile in corridor)
3,494.27 x 39.43 = 1,377.88 (estimated primary daily pedestrian trips in corridor)

A simpler way to capture pedestrian trips is to multiply the population by the area's mode split if that number is known and includes all trips (children, too). To assure that the total estimated numbers are close to actual activity, obtain transit ridership numbers and the number of area school children not bussed.

At this pilot site, the estimated trips is similar to the known activity. The local transit authority' spot check revealed 380 corridor boardings and 363 corridor deboardings totaling 743 daily transit trips. The middle school has 670 children [13]enrolled with 280 bussed leaving a total of 390 children either walking/bicycling to school or parent driven. These two numbers alone, discounting any other pedestrian trips to the McDonald's, the ball fields, any of the grocery or mini-mart stores, or even to a friend's shows 1,133 trips.

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[11] Thurston Regional Planning Council TAZ 1994 data

[12] *Nationwide Personal Transportation Survey*/University of North Carolina Highway Safety Research Center

This corridor is rich with pedestrian attractors: ball fields and soccer parks, numerous fast foods restaurants, video rentals, and mini-marts. Attractor information collected earlier revealed the college branch campus has 500 students daily attending classes. The grocery store closest to the developments has 1,200 weekday customer transactions (not people but actual purchases). One of the fast food retailers has 3,169 daily transactions. Comparing these activities with the numbers generated by this method substantiate this process.

Unfortunately, this method does not factor in secondary trips such as noon time trips from employment sites. It also does not factor in route directness. However, it does give a fairly accurate picture of the potential pedestrian activity in a corridor.

CONCLUSION

This method provides a tool to measure potential pedestrian activity levels. It is a quick method for traffic engineers or planners to identify which corridors have the highest pedestrian activity. While it does not account for other variables, such as terrain and climate, they should be factored in. At this location the terrain is flat (conducive to easier walking conditions) and the region has a temperate climate, although the rainy seasons would discourage pedestrian activity.

RECOMMENDATIONS

1. Update pedestrian trip generation numbers to reflect suburban corridor conditions (1990s retail types).
2. Develop parameters for state or local prioritization (how many trips warrant full sidewalk installation).
3. Develop method to factor in secondary trips.